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ABSTRACT

To review the relevance of vocational criteria to industry needs, a study was conducted in Hawaii to assess the entry-level employment requirements in the occupational area of diversified agriculture. Materials from other states were reviewed, and three versions of a skills inventory were developed and revised. The third revision of the inventory was finalized and approved for use in an industry-wide canvass, conducted through "force focus" (as opposed to open-ended) interviews. Respondents were people familiar with either animal husbandry, aquaculture, nursery work and general agriculture, or with all major areas of agriculture. The results constitute an inventory of skills, knowledge, and attitudes deemed necessary by technicians and professionals in industry for entry into their respective professions. Those surveyed gave the highest average ratings of importance to attitudes, general management skills, and direct applications in horticulture. The ratings supply an indication of the priorities of those in the field. (This report contains the skills inventory and ratings for each item in the areas of general management, animal husbandry, agricultural construction, crops/general agriculture, plant propagation, horticulture/general, horticulture/flowers, aquaculture, and attitudes.) (KC)

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AN INVENTORY OF SKILLS, KNOWLEDGE AND ATTITUDES
FOR A CAREER IN DIVERSIFIED AGRICULTURE

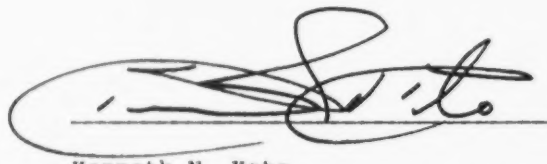
Produced by
Hawaii Statewide Technical Committee on Diversified Agriculture

November, 1989

State Board for Vocational Education

Preface

The Carl Perkins Act of 1984 mandates that each state create technical committees to review the relevance of vocational curricula in terms of industry needs. This is a relevant requirement. We would wish each of our teachers in Hawaii review the relevance of what they teach from time to time. We think that most of our professionals in the classrooms, laboratories and shops do this on an informal basis. This brief document is designed to facilitate and make more overt the process. It is not intended as a curriculum guide. It simply constitutes an inventory of skills, knowledge, and attitudes deemed necessary by technicians and professionals in industry for entry into their respective occupations. The document is a mechanism whereby each educator can reference that which he or she teaches against what industry feels is important. Use it to your advantage and to benefit students enrolled in your program.

A handwritten signature in black ink, appearing to read 'Kato', is written over a horizontal line. The signature is stylized with loops and flourishes.

Kenneth N. Kato

Chairperson of the State Board
for Vocational Education

Acknowledgments

The members of the Statewide Technical Committee were selected with the assistance of the State Council on Vocational Education and the State Department of Agriculture. The State Board for Vocational Education appreciates the many hours provided and the invaluable contributions made by the Statewide Technical Committee on Diversified Agriculture. The members were nominated officially by the Chief Administrative Officer, Dr. Albert Simone.

Those selected and who served on the Statewide Technical Committee on Diversified Agriculture were:

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Aquaculture Development Program

Dan Kinoshita
State Council on Voc. Ed.

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The canvass, data analyses, and technical preparation of this report was done by Dr. William Broadbent of the Office of the State Director for Vocational Education.

Introduction

The Carl Perkins Vocational Education Act of 1984, PL 98-524 had two major themes. These were "access to training for special populations" and "program improvement." This document, as others similar to it, is designed to satisfy the latter objective.

In Section 111 (d) of the law it is mandated that:

"Each State board in consultation with the State Council shall establish a limited number of technical committees to advise the council and the board on the development of model curricula to address State labor market needs. Technical committees shall develop an inventory of skills that may be used by the State board to define state-of-the-art curricula."

It is prudent for everyone to "take stock" of what they do and how they conduct what they do. In the view of ancient philosophers, the unexamined life is not worth living. All educators would be well served if they stepped back from time to time to reexamine how they teach and the content of what they teach. This is one of the essential aspects of professionalism. This is particularly true when teaching a subject that clearly has career and employment implications. In such instances it is all the more important to reference what one teaches against that which employers and those with established expertise in the field think is pertinent.

Many times educators choose to teach things for reasons not understood by industry but which represent sound educational practice. Good teaching often involves a rationale that is not always obvious immediately to those

without training in the instructional methods or curriculum development. However, if there is little or no congruence between the knowledge, skills, and attitudes that employers think are important and what is taught in schools and colleges, something may be amiss.

If the existing curriculum objectives are basically consistent with what industry thinks is important, the instructor has reason to be reassured. However, if there is little or no congruence, the instructor may wish to adjust the content of his or her curriculum.

During the course of annual program evaluations conducted by the principal investigator, it became very apparent that the students need to feel that what they were learning would be useful, even essential to obtaining and retaining a good job in a complex technical field. Students need to know and, in fact, want to know that the skills they are mastering are germane to the real world of work.

Teachers should always be in basic control of that what they teach. However, to reiterate, when the goal is the acquisition of a skill having occupational implications, teachers should reference what they do against what industry thinks is important. That is what this brief report is all about.

Purpose

In September of 1985, the State Board for Vocational Education in conformity with federal mandates and local inclinations, mandated that at least two technical committees be made operational each year to assess the entry-level employment requirements of a given occupational area. The technical committees were and are to update occupational information produced in earlier skill assessment surveys or provide information not available previously.

Eight areas have already been reviewed. Reports of findings have been printed and distributed. These are "electronics", automotive technology", "child "care", gerontology", "community sentencing", "computer programming", "graphic arts" and "accounting". One other, "food service" is presently under study. This booklet reports the findings in the area of diversified agriculture. As the reader will note, this particular study attends primarily to nursery and landscaping operations. Greater attention needs to be directed to animal husbandry and aquaculture.

Methods Employed

A review of relevant materials available through the auspices of other states was facilitated by the Western Curriculum Coordinating Center. The Statewide Technical Committee on Diversified Agriculture with the help of resource staff members from the State Board for Vocational Education, then developed an "inventory" of knowledge, skills, and attitudes necessary for successful participation in the field of diversified agriculture. Three versions of the inventory were developed and revised. Some preliminary items from the initial list were deleted and others were added.

The third revision of the inventory was finalized and approved by the committee for use in an industry-wide canvass. The sample was obtained from directories provided by the Hawaii Association of Nurserymen, Hawaii Farm Bureau Federation, Hawaii Food Manufacturers Association and Hawaii Aquaculture Association. A stratified sample was used. Representation in the sample was generally commensurate to the size of the group.

It was decided to use "forced firms" interview in lieu of mailed questionnaires. In the past those participating in mailed questionnaire canvasses were not always totally representative of the group even though randomization was employed. Some responses to mailed questionnaires also gave indications of confusion on the part of the respondent as to what was expected. Interviews directed at a specific population solved both of these problems.

The interview was "force focus" as opposed to being "open ended" in that the principal investigator wanted the respondent to react specifically to the inventory items in a precise and quantifiable manner. Extraneous comments were noted but are not contained herein.

The results are reported in this document which is succinct and designed to expedite easy perusal (refer to Table 1). The X symbol denotes the average or mean score. The data reported are descriptive and non-inferential in nature. As a consequence, they are easy to understand and interpret by anyone willing to take sufficient time to do so.

Interpretation

The diversified agriculture data provided in Table 1, may be interpreted using the follow guidelines:

Average score of 2.4 or above can be considered "essential"

Average score of 2.0 can be considered "important"

Average score of 1.5 can be considered "desirable"

Summary of Findings

The respondents could be divided into four groups: 1) those familiar with animal husbandry; 2) those familiar with aquaculture; 3) those familiar with nursery work and general agriculture; and 4) those who were sufficiently confident to answer questions in all major areas. This is why the incidence of response in the "non-applicable" category varies so greatly from section to section.

In computing the mean or average rating, an adjustment was made to compensate for the high rate of "non-applicable" in the animal husbandry and aquaculture categories. To have included these responses in the calculation of the means would have resulted in a distorted picture. For some nurserymen the skill and knowledge criteria for animal husbandry and aquaculture were irrelevant. However, for the generalists or those employed in more general industrial applications, they were important. As a result the means were computed without considering the non-applicable responses.

Although generally representational, the sample was slightly skewed towards nurserymen because of greater accessibility to this group.

The section receiving the highest average ratings was "attitudes". The specific items of "dependability", "motivation", and "honesty" were rated highest with averages of 2.8. It was less important to be a "team player". The means rating here was 2.3.

Under the heading "general management", the specific items of "record keeping", "loan requirements", and "regulatory requirements" all received

average ratings of between 2.5 and 2.6. Use of "records", "income statement analysis", "break even analysis" and "cash flow" were considered comparatively less important. In "animal husbandry" all of the ratings were 2.2 or higher.

"Agricultural construction" had comparatively low scores. "Fence construction" rated only a 1.5 average as did "woodworking and metalworking skills". Under the general heading of "crops", knowledge of "insect pests" had a high priority. In fact all items having to do with knowledge and use of chemicals tended to have high ratings. The three items dealing with "plant propagation" had comparatively low scores.

Under "horticulture", items that dealt with theoretical considerations and abstract knowledge were not rated as highly as those having direct application. For instance "soil preparation" and "packing" methods had average ratings of 2.5 and 2.8 respectively. On the other hand identification of basic types of fruits and inflorescences had only 1.8 ratings.

As previously mentioned, "animal husbandry" and "aquaculture" had the largest percentage of "non-applicable" responses. Almost half of the respondents declined to answer one or more items in these sections. On preparation of a "business plan", "financing", "constructs grow-out systems", and "design/purchases container" the rate of "non-applicable" responses was over 50%. In general most of the respondents in the field, as opposed to those on the technical committee, tended to believe that novices did not need to be concerned about matters relating to the business end of the operation. Most firms interviewed were owner operated. The proprietor handled all of the business affairs or contracted out for selected services. While a novice may not need to have such skills at the outset of his or her employment, she or he would

need them if they were or are to become entrepreneurs in their own right. Nevertheless the lowest rating, a 1.4, went to "problem solving". Managing "water quality" received the highest rating with an average of 2.7.

The inventory is important in itself. It fairly well describes what the field of diversified agriculture is all about. In that sense all items are relevant. The ratings give some indication of the priorities of those in the field. However, there was some difficulty in expanding upon the prerequisite skills of a novice. A new hire is expected to be a "hewer of wood and a drawer of water". It is not considered appropriate for him to concern himself with management problems or concerns. However, unless he or she develops and practices these skills early in his or her informal apprenticeship, he or she can not aspire to being an entrepreneur or manager. Knowledge of these techniques can be learned on-the-job but some basic preservice preparation is desirable.

Table 1

Inventory of Knowledge, Skills and Attitudes

N = 27

Knowledge and Skills	(3)	(2)	(1)	(0)	Total H%	$\bar{X}$
	Essential H%	Important H%	Desirable H%	Not Necessary H%		
1.0 General Management						
1.1 Maintains accurate record systems for the business including records on production performance, income and expense, labor costs, marketing, equipment maintenance and use, and depreciation	41	30	22	7	100	2.5
1.2 Summarizes and analyzes records to improve efficiency	26	44	23	7	100	1.8
1.3 Interprets an income statement and break even analysis	15	41	33	11	100	1.9
1.4 Understands a break-even analysis for an agri-business	26	37	30	7	100	1.9
1.5 Analyzes a cash flow statement for an agribusiness	11	44	34	11	100	1.8

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills	(3) Essential H%	(2) Important H%	(1) Desirable H%	(0) Not Necessary H%	Total H%	$\bar{X}$
1.6 Identifies the sources and uses of credit in an agribusiness	22	22	27	29	100	1.9
1.7 Understands loan requirements	15	27	29	29	100	2.6
1.8 Takes an accurate inventory	28	48	21	3	100	2.2
1.9 Operates computers and calculators using user friendly language	7	37	45	11	100	1.6
1.10 Purchases supplies	33	33	27	7	100	2.1
1.11 Understands marketing techniques	26	37	26	11	100	2.0
1.12 Familiar with principles of supervision	37	41	19	3	100	2.2
1.13 Identifies sources for production and marketing information	19	36	26	19	100	1.7

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills	(3)	(2)	(1)	(0)	Total	$\bar{X}$
	Essential H%	Important H%	Desirable H%	Not Necessary H%		
1.14 Familiarity with regulatory requirements pertaining to pesticide usage, hazardous materials, toxic waste disposal, and OSHA, and permit requirements	59	27	11	3	100	2.5
1.15 Can estimate with reasonable accuracy	27	48	22	3	100	2.0
1.16 Proficient in general math	22	63	15	0	100	2.0
2.0 Animal Husbandry						
2.1 Applies approved practices in breeding and care of new-born animals	19	19	11	51	100	2.2
2.2 Cleans and disinfects pens and housing	26	7	16	51	100	2.2
2.3 Pens sick, weak or injured animals separately	26	3	20	51	100	2.2
2.4 Medicates sick and injured animals	26	7	11	56	100	2.3

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills		(3) Essential H%	(2) Important H%	(1) Desirable H%	(0) Not Necessary H%	Total H%	$\bar{X}$
2.5	Interprets labels and medications	22	15	15	48	100	2.4
2.6	Determines when to call a veterinarian	34	3	11	52	100	2.6
2.7	Determines proper amounts of feed, water, and supplemental feed for various types of livestock	29	8	11	52	100	2.5
2.8	Identifies spoiled feed	29	8	11	52	100	2.4
2.9	Understands state and federal feed laws	18	22	8	52	100	2.2
3.0	Agricultural Construction						
3.1	Constructs fences	8	29	41	22	100	1.5
3.2	Joins tubing and pipe	11	44	33	11	100	1.7
3.3	Mixes, finishes and places concrete	11	26	44	19	100	1.9
3.4	Uses wood-working and metalworking skills in construction and repair of buildings and equipment	8	33	44	15	100	1.5

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills		(3) Essential H%	(2) Important H%	(1) Desirable H%	(0) Not Necessary H%	Total H%	$\bar{X}$
4.0	Crops/General Agriculture						
4.1	Selects and evaluates seed to maximize yield	33	37	15	15	100	2.2
4.2	Adjusts the recommended seeding rate of planters to allow for differences in purity, germination, seed size and row width	26	33	26	15	100	2.0
4.3	Prepares seedbeds for planting	33	45	7	15	100	2.3
4.4	Performs field adjustments and minor field repairs on planting and tillage equipment and power sources	22	45	15	18	100	2.0
4.5	Operates planting, plowing, and tillage equipment and power sources	29	38	11	22	100	2.2

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills	(3) Essential H%	(2) Important H%	(1) Desirable H%	(0) Not Necessary H%	Total H%	$\bar{X}$
4.6 Determines the minimum requirements that pertain to the design, installation, and performance of sprinkler and furrow irrigation equipment	27	44	18	11	100	2.0
4.7 Able to use water measurements and conservation factors	27	45	14	14	100	2.1
4.8 Familiar with state and local stream rights and groundwater policies	14	38	34	14	100	1.8
4.9 Interprets water analysis reports, use of water classification tables, and availability of water supply data	7	34	41	18	100	1.5
4.10 Identifies insect pests and nematode damage and plan effective control	59	27	7	7	100	2.6
4.11 Calibrates pesticide applicators	56	22	7	15	100	2.6

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills	(3) Essential H%	(2) Important H%	(1) Desirable H%	(0) Not Necessary H%	Total H%	$\bar{X}$
4.12 Uses attractants and/or traps to anticipate a rise in insect population	15	34	29	22	100	1.8
4.13 Mixes pesticides for control of insects and diseases	37	49	7	7	100	2.3
4.14 Identifies and dis- tinguishes between harmful and beneficial crop insects	59	26	0	15	100	2.7
4.15 Operates pesticide control equipment	34	44	11	11	100	2.2
4.16 Performs field adjustments and minor field repairs	26	48	15	11	100	2.1
4.17 Calibrates herbicide control applicators correctly	41	41	3	15	100	2.4
4.18 Cleans and disinfects all equipment	37	41	11	11	100	2.3

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills	(3) Essential H%	(2) Important H%	(1) Desirable H%	(0) Not Necessary H%	Total H%	$\bar{X}$
4.19 Interprets and follow chemical label directions for pesticide storing, mixing and handling	71	19	3	7	100	2.7
4.20 Identifies dangers of chemical carry residues in soil and application equipment	41	49	3	7	100	2.4
4.21 Identifies crop diseases	45	45	3	7	100	2.4
4.22 Identifies and appraises the performance of recommended pesticides	33	49	11	7	100	2.2
4.23 Manages a weed-control program to reduce losses and maximize yield	37	49	7	7	100	2.3
4.24 Provides weed control	37	45	7	11	100	2.2
4.25 Selects and applies fertilizer to achieve maximize return	37	53	3	7	100	2.4

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills		(3) Essential H%	(2) Important H%	(1) Desirable H%	(0) Not Necessary H%	Total H%	$\bar{X}$
4.26	Operates and maintain engines and equipment for efficient operation	7	41	37	15	100	1.6
5.0	Plant Propagation						
5.1	Performs air layering	18	38	29	15	100	1.8
5.2	Makes cuttings	37	26	26	11	100	2.1
5.3	Performs grafting and facilitates budding	15	33	37	15	100	1.7
6.0	Horticulture/ General						
6.1	Understands leaf structure	22	37	26	15	100	1.9
6.2	Understands stem structure and composition	22	34	29	15	100	1.9
6.3	Identifies the basic types of fruits and inflorescences of trees	15	34	29	22	100	1.8
6.4	Understands the role of chlorophyll in photosynthesis	22	34	29	15	100	1.9

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills	(3) Essential H%	(2) Important H%	(1) Desirable H%	(0) Not Necessary H%	Total H%	$\bar{X}$
6.5 Familiar with disease organisms (e.g., fungi, bacteria, and viruses)	55	27	11	7	100	2.5
6.6 Understands culture conditions each crop requires	53	29	11	7	100	2.4
6.7 Recognizes pesticide poisoning and familiar with relevant first aid	59	19	11	11	100	2.5
6.8 Recognizes common nutritional deficiencies	48	30	11	11	100	2.4
6.9 Identifies herbicide damage	48	34	11	7	100	2.4
6.10 Maintains various types of irrigation systems for controlled environments	26	37	22	15	100	2.0
6.11 Uses resources of nursery extension agent and university	27	55	7	11	100	2.2

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills		(3) Essential H%	(2) Important H%	(1) Desirable H%	(0) Not Necessary H%	Total H%	$\bar{X}$
7.0	Horticulture/Flowers						
7.1	Understands soil preparation and/or planting medium	53	37	3	7	100	2.5
7.2	Understands greenhouse management	48	30	15	7	100	2.4
7.3	Harvests correctly	41	37	11	11	100	2.3
7.4	Understands post-harvesting techniques of wash chemicals prep used	41	37	11	11	100	2.3
7.5	Packs and uses proper shipping methods	44	23	7	26	100	2.8
8.0	Aquaculture						
8.1	Locates a feasible aquaculture site	26	15	19	40	100	2.1
8.2	Analyzes environmental resources	19	26	11	44	100	2.1
8.3	Analyzes economic factors	30	11	18	41	100	2.2

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills	(3) Essential H%	(2) Important H%	(1) Desirable H%	(0) Not Necessary H%	Total H%	$\bar{X}$
8.4 Selects an aquatic species	30	22	7	41	100	2.5
8.5 Analyzes viability of aquatic species	37	15	7	41	100	2.5
8.6 Analyzes market-ability of species	26	22	11	41	100	2.5
8.7 Establishes a business	19	19	14	48	100	2.0
8.8 Prepares business plan	19	15	15	51	100	2.0
8.9 Obtains financing	19	11	19	51	100	1.7
8.10 Maintains accurate record systems	22	27	7	44	100	2.2
8.11 Markets products	30	11	11	48	100	2.0
8.12 Designs a facility and operating strategy	19	19	19	44	100	2.5
8.13 Prepares a lay-out plan for production system	22	22	7	48	100	2.3
8.14 Determines construction and operating costs	30	11	15	44	100	2.3

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills	(3) Essential H%	(2) Important H%	(1) Desirable H%	(0) Not Necessary H%	Total H%	$\bar{X}$
8.15 Anticipates expected problems and solves	22	26	4	48	100	1.4
8.16 Determines market supply and demand	19	22	11	48	100	2.1
8.17 Fulfills permit requirements	30	19	7	44	100	2.4
8.18 Determines permits needed	26	11	19	44	100	2.1
8.19 Obtains permits	26	11	19	44	100	2.1
8.20 Constructs grow-out system	15	22	11	52	100	2.0
8.21 Constructs earthen ponds	19	26	11	44	100	2.1
8.22 Constructs cages	19	26	7	48	100	2.2
8.23 Constructs concrete raceways	15	22	15	48	100	2.0
8.24 Constructs tanks	15	22	19	44	100	1.9
8.25 Stocks target species	26	19	11	44	100	2.3
8.26 Determines stocking density	26	15	15	44	100	2.2

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills	(3) Essential H%	(2) Important H%	(1) Desirable H%	(0) Not Necessary H%	Total H%	$\bar{X}$
8.27 Monitors stocking material for disease	37	15	4	44	100	2.6
8.28 Monitors pond for predators	26	26	4	44	100	2.4
8.29 Acclimates stocking material to pond then release	30	19	4	48	100	2.5
8.30 Cultures species	26	22	7	44	100	2.3
8.31 Manages water quality and system	41	11	4	44	100	2.7
8.32 Manages pond's (system's) natural productivity	33	19	4	44	100	2.5
8.33 Controls excess aquatic vegetation and growth	22	26	7	44	100	2.3
8.34 Feeds	26	15	15	44	100	2.2
8.35 Maintains pond (system) and improvements	26	22	7	44	100	2.3
8.36 Harvests	30	19	4	48	100	2.5
8.37 Sorts and grade	22	30	0	48	100	2.4

Inventory of Knowledge, Skills and Attitudes

Knowledge and Skills	(3) Essential H%	(2) Important H%	(1) Desirable H%	(0) Not Necessary H%	Total H%	$\bar{X}$
8.38 Chills, freezes, maintains live	26	11	15	48	100	2.2
8.39 Transports to market- place	22	7	22	48	100	2.0
8.40 Design/ purchases container	11	30	7	51	100	2.1
8.41 Transports by truck, air, boat	15	19	19	48	100	1.9
9.0 Attitudes						
9.1 Dependability	81	19	0	0	100	2.8
9.2 Adaptability	63	33	4	0	100	2.6
9.3 Motivation	81	19	0	0	100	2.8
9.4 Team player	51	30	19	0	100	2.3
9.5 Self-starter	59	33	7	0	100	2.5
9.6 Pride in work	70	30	0	0	100	2.7
9.7 Honesty	85	11	4	0	100	2.8
9.8 Eager to learn	67	30	4	0	100	2.6